WHAT IS CLAIMED:

1.   A method for self-synchronization of modular production systems having a plurality of components with a plurality of alternative capabilities for processing and transporting work units along at least one transport highway, wherein the components and the at least one transport highway are arranged in a configuration, the method comprising:

determining jobs of interest, wherein each said job includes not less than one work unit to be produced;

determining the configuration of the components and the at least one transport highway, wherein said configuration comprises at least one loop, and wherein the components include at least one machine module;

determining the duration time for each of the components, wherein said duration time comprises the elapsed time from receipt of a work unit at the component's input location to arrival of the work unit at the component's output location;

determining at least one default self-synchronization time, wherein said default self-synchronization time comprises a multiple of said duration time for said at least one machine module; and

optimizing said default self-synchronization time by adjusting at least one component duration time.

2.   The method for self-synchronization of modular production systems according to claim 1, further comprising at least one off-ramp and at least one on-ramp.

3.   The method for self-synchronization of modular production systems according to claim 2, wherein the configuration comprises a single loop including at least one machine module component associated with at least one off-ramp and at least one on-ramp and a plurality of highway segments, wherein said highway segments enable the work units to flow through said at least one component or to bypass said at least one component.

4. The method for self-synchronization of modular production systems according to claim 2, wherein the configuration comprises at least two loops connected serially with shared highway segments, wherein each of said loops includes at least one machine module component associated with at least one off-ramp and at least one on-ramp and a plurality of highway segments, wherein said highway segments enable the work units to flow through said at least one component or to bypass said at least one components.

5. The method for self-synchronization of modular production systems according to claim 2, wherein the configuration comprises at least two loops connected in parallel with shared highway segments, wherein each of said loops includes at least one machine module component associated with at least one off-ramp and at least one on-ramp and a plurality of highway segments, wherein said highway segments enable the work units to flow through said at least one component or to bypass said at least one component.

6. The method for self-synchronization of modular production systems according to claim 3, wherein determining the default self-synchronization time comprises determining the sum of the total minimum duration times for all components on said single configuration loop.

7. The method for self-synchronization of modular production systems according to claim 4, wherein determining the default self-synchronization time comprises determining the difference between the default duration time for bypassing the components and moving the work units through the components.

8. The method for self-synchronization of modular production systems according to claim 5, wherein determining the default self-synchronization time comprises synchronizing said at least two parallel loops.

9.   The method for self-synchronization of modular production systems according to claim 1, wherein adjusting at least one component duration time comprises adding an adaptation time to the duration time of at least one selected component.

10.   The method for self-synchronization of modular production systems according to claim 9, wherein said adaptation time comprises the difference between said duration time for at least one selected machine module and the default self-synchronization time for said selected machine module's configuration loop.

11.   A system for self-synchronization of modular production systems having a plurality of components with a plurality of alternative capabilities for processing and transporting work units along at least one transport highway, wherein the components and the at least one transport highway have a configuration, the method comprising:

means for determining jobs of interest, wherein each said job includes not less than one work unit to be produced;

means for determining the configuration of the components and the at least one transport highway, wherein said configuration comprises at least one loop, and wherein the components include at least one machine module;

means for determining the duration time for each of the components, wherein said duration time comprises the elapsed time from receipt of a work unit at the component's input location to arrival of the work unit at the component's output location;

means for determining at least one default self-synchronization time, wherein said default self-synchronization time comprises a multiple of said duration time for said at least one machine module; and

means for optimizing said default self-synchronization time by adjusting at least one component duration time.

12.   The system for self-synchronization of modular production systems according to claim 11, further comprising at least one off-ramp and at least one on-ramp.

13. The system for self-synchronization of modular production systems according to claim 12, wherein the configuration comprises a single loop including at least one machine module component associated with at least one off-ramp and at least one on-ramp and a plurality of highway segments, wherein said highway segments enable the work units to flow through said at least one component or to bypass said at least one components.

14. The system for self-synchronization of modular production systems according to claim 12, wherein the configuration comprises at least two loops connected serially with shared highway segments, wherein each of said loops includes at least one machine module component associated with at least one off-ramp and at least one on-ramp and a plurality of highway segments, wherein said highway segments enable the work units to flow through said at least one component or to bypass said at least one components.

15. The system for self-synchronization of modular production systems according to claim 12, wherein the configuration comprises at least two loops connected in parallel with shared highway segments, wherein each of said loops includes at least one machine module component associated with at least one off-ramp and at least one on-ramp and a plurality of highway segments, wherein said highway segments enable the work units to flow through said at least one component or to bypass said at least one component.

16. The system for self-synchronization of modular production systems according to claim 13, wherein determining the default self-synchronization time comprises determining the sum of the total minimum duration times for all components on said single configuration loop.

17. The system for self-synchronization of modular production systems according to claim 14, wherein determining the default self-synchronization time

comprises determining the difference between the default duration time for bypassing the components and moving the work units through the components.

18.   The system for self-synchronization of modular production systems according to claim 15, wherein determining the default self-synchronization time comprises synchronizing said at least two parallel loops.

19.   The system for self-synchronization of modular production systems according to claim 11, wherein adjusting at least one component duration time comprises adding an adaptation time to the duration time of at least one selected component.

20.   The system for self-synchronization of modular production systems according to claim 19, wherein said adaptation time comprises the difference between said duration time for at least one selected machine module and the default self-synchronization time for said selected machine module's configuration loop.

21.   An article of manufacture comprising a computer usable medium having computer readable program code embodied in said medium which, when said program code is executed by said computer causes said computer to perform method steps for self-synchronization of modular production systems having a plurality of components with a plurality of alternative capabilities for processing and transporting work units along at least one transport highway, wherein the components and the at least one transport highway have a configuration, the method comprising:

    determining jobs of interest, wherein each said job includes not less than one work unit to be produced;

    determining the configuration of the components and the at least one transport highway, wherein said configuration comprises at least one loop, and wherein the components include at least one machine module;

    determining the duration time for each of the components, wherein said duration time comprises the elapsed time from receipt of a work unit at the component's input location to arrival of the work unit at the component's output location;

determining at least one default self-synchronization time, wherein said default self-synchronization time comprises a multiple of said duration time for said at least one machine module; and

optimizing said default self-synchronization time by adjusting at least one component duration time.